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MILK

ALL foods are of greater or lesser importance to the community, but there is one that stands out far beyond all others, and that one is *milk*. There are two reasons why this is true: First, it is a complete food; it contains all of the necessary food constituents—those that supply heat, provide for growth, and enable the body to do work. Second, it constitutes (or should do so) the exclusive food of those infants who may not be nourished in the natural way, but are brought up on the bottle. For the very young there is nothing that can properly be substituted for it, although the makers of many patented foods would have us believe otherwise.

Composition of Milk

Milk contains fat in the form of very small globules that cannot be seen without a microscope; they rise

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to the top when milk is allowed to stand without being disturbed, and then they constitute the important part of the cream. When this is churned in the usual way, or beaten in a bowl with a fork, or shaken for a time in a bottle, the little fat globules are brought together into small masses that can be seen without a microscope; and these come together into still larger ones, which, when properly worked, become butter.

A second valuable substance contained in milk is a peculiar kind of sugar known as lactose, or sugar of milk. When this is separated from whey in the form of a white powder, it will keep indefinitely without spoiling; but in solution (as it is in milk) it becomes changed very quickly, and gives rise to an acid (lactic acid) which accumulates to a certain point and then curdles the milk. This curdling or "souring" of milk comes on much more quickly under some conditions than under others; and the sooner it occurs after the milk leaves the cow, the surer we may be that somebody

has been guilty of carelessness either in drawing the milk, or handling it, or taking care of it. This matter we will consider later.

A third very important part of the food material in milk is commonly spoken of as the cheesy matter, or curd. This consists of a number of compounds which are closely related to white of egg and the albuminous principles of meat and fish. The principal one is known as casein, and the next in importance is lactalbumin. They constitute about one third by weight of ordinary cheese.

Next we have a small amount of salts of various kinds which are useful to the body in various ways, and especially in the formation of bone. All of the substances mentioned make up about thirteen per cent of the whole; that is to say, a hundred pounds of milk (and that is less than fifty quarts) will yield about thirteen pounds of solid food, the other eighty-seven pounds being water. These thirteen pounds may be divided as follows: butter, four pounds; sugar, five pounds; dry curds, three pounds

and five ounces; and salts, eleven ounces. There is no food which is so admirably suited to fill the needs of the body as milk. The body needs a certain daily amount of fat, of sugar or starchy matter (either will do), and of albuminous substances and salts; and if it were necessary to do so, one could subsist on milk alone without having to consume an enormous volume of it daily; but this cannot be said of any other single food. Meat alone would provide neither sugar nor starch, and the same is true of fish and eggs; wheat or any other cereal would provide all of the substances needed, but in order to get enough of one of them (the fat) it would be necessary to eat a very large excess of all the others. Hence it is that bread naturally calls for butter, and meat or fish for potatoes (starch).

Importance of Wholesome Milk

Milk is important chiefly on account of the needs of infants and very young children. Older children and adults can get along without milk, if necessary, since their digestive organs, in a

state of health, can take care of anything that is fit to eat; but with infants it is a different story. Many ignorant mothers give meat and vegetables, bread, cake, and fruit to very young children, even only a few months old, but it is highly improper to do so, and the practice is one that doubtless causes much sickness and many deaths. Even milk itself cannot be given safely to very young infants without being thinned with water and made sweeter by the addition of sugar, in order to resemble more closely mother's milk; hence in many large cities and towns, the preparation of what is known as "Modified Milk" or "Humanized Milk" has become an important industry.

As has been already stated, milk is the most important of foods, especially for infants. It is, or should be, their only food; and this being the case, they are entitled to have it provided for them in a condition that will cause them no injury. Unfortunately, however, it is a fact that a very large proportion of the deaths of infants and of very young children is due to forms of food poison-

ing which we know under the familiar terms "summer diarrhœa," "cholera infantum," and "infantile diarrhœa." Deaths from diarrhœal diseases among infants fed at the breast are far less common than among the bottle-fed. Indeed, it is believed that more than ninety per cent of the deaths among children under one year of age are of those who are not nursed at the breast. Now, why is this so, and what can be done to prevent it?

The reason for this great mortality is that all milk is likely to undergo changes which may make it a dangerous food unless proper precautions are taken to prevent them, and that these precautions are very commonly neglected. Among these changes, as was said above, is one that affects the milk sugar, which begins to diminish in amount very soon after the milk is drawn, and forms an acid. This change is due to the presence of certain forms of bacteria that find milk an ideal substance in which to grow. Several hundred different kinds of bacteria have been found in milk, the great majority

of which are believed to do the drinker no harm; some attack the sugar and form acid, some attack the other constituents, especially the cheesy matters; but certain kinds are believed to form poisonous matters while they grow and multiply; and others, of a naturally dangerous nature, multiply rapidly and make their mischief after reaching the stomach.

Sources of Bacteria in Milk

Where do these bacteria get into the milk, and why can they not be kept out? The vast majority do not get into the milk at all; they have never been anywhere else, for they grow there! It is this way: In common life, bacteria are everywhere; some are harmful, but the great majority are useful. They exist in the purest drinking water, in the soil, and in the air; they are on your hands and faces and all other parts of your bodies; they are in your clothes and on everything that you take into your hands; they are in every layer of dust that you see on the furniture and books; but mostly they do no harm.

The bowel discharges of man and animals contain bacteria in numbers beyond one's comprehension, and among the species present there may be some that are capable of causing disease.

Now a cow is naturally an unclean animal; she lies in her own filth in a contented sort of way, and when she gets up she makes no effort to remove it from her hair, as a cat would do, but allows it to dry on. A cow stable cannot be kept clean like a parlor or bedroom, no matter how much one may try; but it can be kept in a decent condition with a reasonable effort. Unfortunately, the average cow stable is not kept very clean. In addition, it is often a very dusty place, especially when hay is brought in or thrown down from the loft. The farm hand who milks the cow does other work at other times in the same clothes. Ordinarily, he is not dressed in clothing in which he would care to go to church or to attend any form of social entertainment; it is not scrupulously clean. The milk pail and cans may have been airing all day outside the barn, or they

may have been standing inside, near at hand. Now let us follow the process of milking a cow as we may see it carried out in some places. The cows, fresh from the pasture, are driven into the barn, and each goes to her accustomed place; there is dust in the air, and their entrance adds to its amount. They stand switching their tails against their sides, which may or may not be caked with mud and other filth, and more dust is dislodged into the air. The "hired man" now picks up his pail, pushes his way between two of the cows, puts down his stool, takes his seat, and is ready to begin. He lets the first few jets of milk go to waste, because his experience has taught him that its admission to the pail will perhaps bring on souring much more quickly; or perhaps he uses it as a lubricant for his hands. Soon, he is milking vigorously into the pail, and with every motion of his hands, and with every pressure from him against any part of the cow, hairs laden with bacteria are dropping into the pail. Meanwhile, every switch of the tail is

sending them about by thousands. Finally, the process is finished and the milker begins on another. As fast as the pail is filled it is strained into cans, which eventually are placed somewhere where their contents may cool off. Now what is the condition of that milk likely to be? The pail contained bacteria from the start; every hair that fell into it during milking brought hundreds and thousands; every particle of dried excrement that gained access brought in still more; many came in with the dust of the air and from the person and clothing of the milker. Thus, it will be seen, the milk is well planted with bacteria of various kinds, harmful, perhaps, as well as harmless. Now, bacteria are plants of exceedingly rapid growth, and warm milk is an excellent soil for them. They increase and multiply with almost inconceivable rapidity, especially if the milk stays warm. If the milk is chilled at once, however, and kept below 45° Fahrenheit, the multiplication of bacteria is checked, and thus milk which is dirty may not increase its number of con-

tained bacteria very materially. On the other hand, milk which is as clean as possible when drawn (that is to say, from clean cows kept in a clean stable, and milked by clean men into clean pails), but which is allowed merely to cool down naturally to the temperature of the air, may, at the end of twenty-four hours, contain vastly more numerous bacteria than a dirty milk properly cooled and stored, so great is the favoring influence of warmth on growth.

How Can Milk be Kept from Becoming Unwholesome?

It is not to be inferred from the above that all milk and all milk-farms are dirty, but it is proper to say that no milk can be absolutely free from bacteria, even from the cleanest of places. The greater the degree of cleanliness and the greater the care in cooling and storing, the smaller the number of bacteria in the milk when it arrives in the home. Temperature is of the very greatest importance; and milk should, therefore, be kept cool from the time of pro-

duction until it is wanted for use. Cleanliness, also, is as imperative in the home as at the farms and during transportation, and the family supply should be kept in clean vessels in clean refrigerators.

If all milk used as such for food were clean at the start; if it were kept clean and cool until needed; if it were never allowed to come in contact with unclean nursing bottles and nipples, the infant mortality would diminish tremendously.

In some cities the intelligent part of the public refuses to buy milk of any dealer who cannot produce a certificate that his product is from clean cows on clean farms, and that the number of bacteria in a certain volume is less than that established as a limit by the authority that supplies the certificates and makes the periodical examinations. If there are young children, and especially bottle-fed infants, in the family, it is far better and safer to buy milk of only that class of dealers. Parents should bear in mind that dirty milk is a dangerous food, and that milk originally

clean but not properly cared for can be equally dangerous to the health of infants and young children. They should insist upon having clean milk; and having got it, should keep it in a separate compartment in a clean refrigerator. On no account should one use nursing bottles with long tubes, or feed any milk that is stale or warmed over.

Many physicians and others recommend sterilizing milk by heating it nearly to boiling, in order to lessen the danger of diarrhœal disease. This is certainly better than using dirty milk just as it is, but very young children do not always do well on sterilized milk; in fact, they sometimes appear to suffer injury from it. Better than all is clean, pure milk that needs no sterilization to be made fit for use.

Adulteration of Milk

It is unfortunate that some of those who deal in milk are not content with the fair profit that they can properly gain from its sale, but seek to increase it in dishonest ways. The commonest method of adulteration is the addition

of water; this lowers the nutritive value of the milk, and makes it possible that a child may be partly starved, although getting the proper volume of food. The next commonest is the removal of the cream, which brings a higher price than milk, and the sale of the skimmed milk as whole milk. Here again comes in the possibility that a child may undergo fat-starvation, since its food may contain practically no fat; and fat, as we know, is a very important food for young and old alike. Other, less common, forms of adulteration are the addition of yellow coloring matters that cause watered or skimmed milk to look rich, and of chemical preservatives, which enable the dealer to sell stale milk, that otherwise would turn sour, in place of fresh milk. It is commonly thought that much of the milk sold is composed of chalk and water, but that is quite untrue, and, indeed, impossible; for chalk and water will not mix any better than oil and water. If one should shake chalk and water together and let the mixture stand, all the chalk would set-

tle out in a few minutes, and the water would be as clear as before.

In Massachusetts we have a very strict law against the adulteration of milk, and its enforcement is placed in the hands of the State Board of Health, the Dairy Bureau, and the local inspectors of cities and towns. In consequence of its enforcement with reasonable severity, the milk supply of the state at large is said to be better than that of any other state in the Union, so far as fraudulent practices are concerned.

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